NON-PUBLIC?: N
ACCESSION #: 8901250181
LICENSEE EVENT REPORT (LER)

FACILITY NAME: PLANT HATCH, UNIT 1 PAGE: 1 OF 8

DOCKET NUMBER: 05000321

TITLE: REACTOR SCRAM ON LOSS OF EHC PRESSURE, LOSS OF STARTUP AUXILIARY
TRANSFORMER
EVENT DATE: 12/17/88 LER #: 88-018-00 REPORT DATE: 01/16/89

OPERATING MODE: 1 POWER LEVEL: 085

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.7
(a)(2)(iv), OTHER: FHA Appendix B Section 1.9.1

LICENSEE CONTACT FOR THIS LER:
NAME: Steven B. Tipps, Manager Nuclear Safety and Compliance, Hatch

TELEPHONE: (912) 367-7851

COMPONENT FAILURE DESCRIPTION:
CAUSE: D SYSTEM: BN COMPONENT: V MANUFACTURER: P341
CAUSE: X SYSTEM: EA COMPONENT: 87 MANUFACTURER: W120
REPORTABLE TO NPRDS: Y
REPORTABLE TO NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 12/17/88, at approximately 0002 CST, Unit 1 was in the run mode at approximately 2080 CMWT (approximately 85 percent of rated thermal power). At that time, the main turbine (EIIS Code TA) tripped on loss of Electrohydraulic Control (EHC, EIIS Code TG) system pressure resulting in a reactor scram on turbine stop valve closure. Upon transfer of the nonessential loads to the startup auxiliary transformer (SAT, EIIS Code EA) 1D (as expected following a reactor scram), SAT 1D protective relaying actuated resulting in a loss of power to the Unit 1 nonessential loads.

The cause of the scram was apparently personnel error in that a non-licensed operator implemented a system clearance on the EHC system of the wrong reactor

unit. The cause of the SAT 1D failure was equipment failure. Specifically, malfunctioning transfer relaying resulted in a trip of the transformer supply breaker.

Corrective actions include training of operations shift personnel and replacement and calibration of a transformer differential relay.

END OF ABSTRACT

Plant and System Identification:

General Electric - Boiling Water Reactor
Energy Industry Identification System codes are identified in the text as (EIIS Code XX).

Summary of Event

On 12/17/88, at approximately 0002 CST, Unit 1 was in the run mode at approximately 2080 CMWT (approximately 85 percent of rated thermal power). At that time, the main turbine (EIIS Code TA) tripped on loss of Electrohydraulic Control (EHC, EIIS Code TG) system pressure resulting in a reactor scram on turbine stop valve closure. Upon transfer of the nonessential loads to the startup auxiliary transformer (SAT, EIIS Code EA) 1D (as expected following a reactor scram), SAT 1D protective relaying actuated resulting in a loss of power to the Unit 1 nonessential loads. The root cause of the scram was apparently personnel error (implementation of a system clearance on the EHC system of the wrong unit). The root cause of the SAT 1D failure was equipment failure. Corrective actions include additional training of Operations personnel and calibration, testing, and repair of equipment.

DESCRIPTION OF EVENT

On 12/16/88, at approximately 2357 CST, Unit 1 reactor power had been reduced to approximately 85 percent of rated thermal power in order to perform surveillance testing. At that time, the '600 V Station Service Feeder Breaker Tripped' annunciator alarmed and cleared in a matter of seconds. The alarming annunciator is indicative of the feeder breaker to one of the 600V station service loads (e.g., an EHC pump) being tripped. Licensed operators searched the control panels for a tripped breaker indication, but found none. At approximately 0000 CST, on 12/17/88, the EHC 'Hydraulic Fluid Level Hi/Low' annunciator alarmed. At that time, control room instrumentation indicated that the "A" EHC pump was tripped. Also, no status lights for the "B" EHC pump were illuminated, and EHC pressure was found to be decreasing. Operations personnel were dispatched to check the EHC pumps. At approximately

0002 CST, the turbine tripped on low EHC fluid pressure resulting in a reactor scram on turbine stop valve closure.

Following the turbine trip and scram, the nonessential 4 kilovolt (KV) busses 1A, 1B, 1C, and 1D attempted to transfer from the two unit auxiliary transformers (UATs) to the two startup auxiliary transformers (SATs) as designed. 4KV busses 1C and 1D successfully transferred to SAT 1D. However, the 230KV supply breakers to the SAT 1D tripped open on a protective relaying actuation de-energizing the transformer.

The essential 4KV busses 1E, 1F, and 1G, which are normally supplied by SAT 1D, then experienced an undervoltage condition resulting in a fast transfer to SAT 1C. Rated voltage was restored to the busses upon completion of the transfer. The Emergency Diesel Generators (EDG, EIIS Code EK) automatically started upon detection of the instantaneous undervoltage condition on the essential busses and came up to speed as designed. However, they did not tie to the busses because rated voltage was restored to the essential busses within the required time frame.

4KV nonessential busses 1A and 1B had transferred to SAT 1C but were then 'load shed' per design when essential busses 1E, 1F, and 1G transferred to SAT 1C. Consequently, loss of SAT 1D resulted in loss of power to the nonessential loads on Unit 1.

As expected with the reactor scram, the accompanying void collapse resulted in a decrease in reactor water level. When water level reached approximately 12.3 inches above instrument zero, a Primary Containment Isolation System (PCIS, EIIS Code JM) valve Group 2 isolation occurred as designed.

At approximately 0003 CST, one minute after the scram, the Reactor Core Isolation Cooling (RCIC, EIIS Code BN) system was manually started to maintain vessel level. At approximately 0004 CST, the High Pressure Coolant Injection (HPCI, EIIS Code Bj) system was manually started to assist in maintaining vessel level. During the event, reactor water level was maintained between approximately 30 inches below instrument zero (above the -35.0 inches setpoint for auto initiation of HPCI and RCIC) and 52 inches above instrument zero (corresponding to approximately 135 inches and 217 inches above top of active fuel). HPCI and RCIC were used periodically throughout the remainder of the event to assist in mitigating pressure and water level transients.

At approximately 0027 CST, the Main Steam Isolation Valves (MSIVs, EIIS Code JM) were closed due to decreasing condenser vacuum and loss of steam seals. With the reactor pressure vessel now isolated from the main condenser (EIIS Code SG), the increase in reactor pressure due to decay heat was controlled via the use of RCIC, HPCI, and Low Low Set (LLS, EIIS Code JE). In this plant configuration, Operations personnel, in accordance with the requirements of the Emergency Operating Procedures (EOPs), allowed reactor pressure to increase to fulfill the high pressure portion of the LLS arming logic. At approximately 0035 CST, Operations personnel manually opened one of the LLS safety relief valves (SRVs) to complete the arming of the LLS logic. The LLS SRVs then operated in their LLS mode, opening as needed to control reactor pressure. The highest reactor pressure reached during the event was approximately 1078 psig.

At approximately 0116 CST, during one of the periodic cycles previously mentioned, HPCI was manually started to assist in pressure control. The resultant reduction in pressure caused vessel water level to swell to the reactor water high level setpoint. The HPCI and RCIC systems received a trip signal on high water level. HPCI tripped as designed. The RCIC turbine steam supply valve 1E51-F045 failed, to close fully as required. The valve stopped in an intermediate position with the turbine at 2000 rpm and the pump at 100 gpm. When the high reactor water level condition cleared, the operator reopened the 1E51-F045 valve in order to use RCIC for pressure control. RCIC turbine speed increased until the electrical overspeed setpoint was reached (the speed demand of the RCIC speed control circuit was upscale due to the 1E51-F045 valve not fully closing) at which time the RCIC trip and throttle valve closed (i.e., the RCIC turbine tripped). The trip and throttle valve was reopened and RCIC operation was restored to assist in controlling pressure. This scenario was repeated several times during the time the SRV's were being used for pressure control.

Due to the loss of SAT 1D during the event, Unit 1 plant lighting except for that of the Control Room was lost. Consequently, the Fire Protection self-contained, battery-powered emergency lighting system automatically activated immediately following the reactor scram. The system is designed to provide lighting for eight hours. Therefore, the emergency lighting system became inoperable at approximately 0802 CST on 12/17/88 due to the discharge of the lighting unit batteries. Some emergency lights were able to provide adequate lighting past 0802 CST. However, due to the nature of the event and the large number of lights involved, the exact time each lighting unit completely discharged could not be determined. By 2215 CST on 12/17/88, power had been restored to the normal plant lighting system and the emergency lighting batteries were being recharged. By 1015 CST on 12/18/88, the emergency lighting batteries were recharged and the emergency lighting system was operable. Consequently, the emergency lighting units had been inoperable for more than 24 hours.

By 1730 CST on 12/17/88, the main transformer had been connected to offsite power and was supplying power to 4KV nonessential busses 1A, 1B, 1C and 1D. At this time, loads were connected to the busses in a controlled manner. No defective conditions were noted during extensive testing and troubleshooting performed on SAT 1D. Subsequently, SAT 1D was returned to service on 12/19/88, at approximately 0105 CST.

CAUSE OF EVENT

The direct cause of the scram was loss of EHC fluid pressure. Specifically, the main turbine tripped on a valid loss of EHC pressure signal. At 10 percent closure of the turbine stop valves, a Reactor Protection System (RPS, EIIS Code JC) actuation was initiated resulting in a scram.

Immediately prior to the loss of Unit 1 EHC, a clearance was being hung on the Unit 2 EHC system to repair a leak. The non-licensed operator who was assigned to perform the Unit 2 clearance maintains that he did, in fact, hang the tags on the Unit 2 EHC pump breakers. In addition, the clearance tags were found hanging on the correct breakers by members of the Event Review Team approximately ten hours after the scram when an error in hanging the clearance was first suspected. It was noted, however, that the clearance tags were somewhat wrinkled, possibly indicating that they had been moved. According to the non-licensed operator, he was exiting the Unit 2 Turbine Building on his way to the control room when plant lighting was lost.

Electrical and mechanical operation of the EHC system was tested thoroughly following the event. No problem which would have caused the operating pump to trip or prevent the standby pump from starting before EHC pressure reached the turbine trip setpoint could be found. The indications which were observed by the operating crew prior to the scram were reproduced in a test by local manual operation of the EHC pump breakers. This supported the hypothesis that the Unit 1 EHC pump breakers had been mistakenly racked out instead of the Unit 2 EHC pump breakers (per the clearance tags).

After considering all aspects of the investigation, Georgia Power Company has concluded that the majority of the evidence supports personnel error as the root cause of this event. No problem could be found with the electrical or mechanical operation of the Unit 1 EHC system and the control room

observations during the transient could only be reproduced by local manual breaker operation. The investigation concluded that the personnel performing the EHC clearance mistakenly racked out the Unit 1 EHC pump breakers when the Unit 2 EHC pump breakers should have been racked out.

An extensive investigation was performed on the SAT 1D failure. The root cause of the failure was a malfunction of the Harmonic Restraint Unit (HRU) in differential relay 1S32-K057-2. The HRU functions to prevent current inrush, typically occurring with a bus transfer, from tripping the transformer differential relay. With the HRU in the tripped condition, the current inrush accompanying the transfer of the 4KV nonessential busses to SAT ID caused the transformer differential relay to trip, opening the supply breakers to the transformer.

The direct cause for the 1E51-F045 valve failing to completely close was actuation of the valve operator torque switch. The root cause for the valve failure was inadequate vendor supplied valve maintenance instructions in that the valve vendor manual and drawing did not address fastening of the yoke stem bushing. The valve yoke is configured such that the bushing prevents rotation of the valve stem, maintaining linear movement of the stem. The bushing is set-screwed to the yoke to prevent rotation of the bushing. The vendor manual and drawing do not address the set screws or a means for securing them. Inspection of the valve following the event showed that the bushing set screws had not been permanently secured (i.e., staked) and eventually backed-out of the yoke allowing the bushing to rotate. It is concluded that the resultant stem and bushing movement resulted in torque values sufficient to actuate the valve operator torque switch.

REPORTABILITY ANALYSIS and SAFETY ASSESSMENT

This report is required per 10 CFR 50.73 (a)(2)(iv) because unplanned actuations of the RPS and the PCIS occurred and because HPCI and LLS were manually initiated during the event to assist in maintaining reactor level and/or pressure. This report is also required per section 1.9.1 of Appendix B of the Fire Hazards Analysis because the self-contained, battery-powered emergency lighting units, required to support unit shutdown in the event of a fire and coincident loss of offsite power, were inoperable for more than 24 hours.

The scram was initiated by a turbine stop valve closure signal. The turbine stop valve closure signal initiates a scram earlier than the Neutron Monitoring System (NMS, EIIS Code JG) signal or reactor vessel high pressure signal. It provides sufficient margin to core thermal-hydraulic limits for certain abnormal operational transients. The turbine bypass valves opened to assist in mitigating the pressure transient resulting from the scram. After approximately 30 seconds, reactor pressure decreased to approximately 920 psig and the turbine bypass valves closed as designed. Due to a loss of EHC pressure, the turbine bypass valves were unable to respond to further reactor pressure variations.

Immediately following the scram, the Recirculation pumps (EIIS Code AD) tripped as designed to assist in mitigating the reactor pressure transient. Also, RCIC and HPCI were manually started immediately following the scram and used throughout the event to assist in reactor pressure and level control. LLS was armed approximately 35 minutes into the event. The SRVs operated in LLS mode as designed to control reactor pressure. Consequently, during the event, the reactor vessel pressure was maintained well below the vessel design pressure and vessel level did not decrease below approximately 135 inches above top of active fuel.

In response to the loss of SAT 1D, essential loads were transferred during the event to SAT 1C as designed. Nonessential loads were load shed from SAT 1C as designed in order to prevent overloading the transformer and losing power to the essential loads.

Loss of the emergency lighting system approximately eight hours after the scram did not affect adversely the ability to achieve or maintain the reactor in a safe shutdown condition. The reactor was maintained in a stable condition with nominal reactor water level and pressure transients prior to and during the time the emergency lighting was inoperable. Control Room lighting (powered from an essential bus) was maintained throughout the event. Also, Operations personnel have access to six volt lanterns which could have provided illumination sufficient for access to other areas of the plant, had the need arisen.

Based on the above information, it is concluded that this event had no adverse impact on plant safety. Additionally, the above analysis is applicable to all power levels.

CORRECTIVE ACTIONS

The necessity for Operations personnel to ensure that they are working on the correct piece of equipment in performance of licensed activities will be stressed by departmental memo to Operations Shift personnel by 2/13/89.

The SAT 1D Differential Relay 1S32-K057-2 including the HRU attachment was replaced and functionally tested on 12/22/88.

Concerning the 1E51-F045 valve, the bushing was installed with the set screws staked. The valve was satisfactorily functionally tested and returned to service on 12/21/88. Appropriate manuals and drawings will be revised to reflect securing of the bushing set screws. The revised manuals and drawings will be implemented by 2/13/89. An investigation will be conducted to determine if a similar problem might exist with other valves. The investigation will be completed by 3/16/89 and corrective actions will be implemented where necessary. Any needed rework will be accomplished on a schedule commensurate with valve location and planned outage activities.

ADDITIONAL INFORMATION

No previous similar events have occurred involving the loss of a startup auxiliary transformer or inoperability of RCIC due to failure of the valve operator of 1E51-F045 to provide adequate thrust.

Previous similar events have occurred involving a reactor scram due to turbine stop valve closure. These events were reported in License Event Reports (LER) 50-321/87-001, dated 2/2/87, 50-321/87-002, dated 2/16/87, 50-321/88-003, dated 3/28/88, 50-366/88-006, dated 4/18/88, 50-321/88-005, dated 5/19/88, and 50-366/88-018, dated 6/27/88. The root causes of these events involved procedural deficiencies and equipment malfunction. These root causes were not a factor in the reactor scram of 12/17/88; therefore, the corrective actions affected to prevent recurrence for the noted similar events would not have acted to prevent the reactor scram of 12/17/88.

FAILED COMPONENT IDENTIFICATION

MPL (Plant Index Identifier): 1E51-F045
Manufacturer: William Powell Co.
Model Number: 16051Y-WE
Type: 4-inch, 600 pound "Y" Globe Valve
EIIS Code: V

MPL (Plant Index Identifier): 1S32-K057-2
Manufacturer: Westinghouse
Model Number: HU-190B346A22
Type: Harmonic Restraint Unit on Differential Relay
EIIS Code: 87

ATTACHMENT 1 TO 8901250181 PAGE 1 OF 2

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January 16, 1989

U. S. Nuclear Regulatory Commission
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PLANT HATCH - UNIT 1
NRC DOCKET 50-321
OPERATING LICENSE DPR-57
LICENSEE EVENT REPORT
REACTOR SCRAM ON LOSS OF EHC PRESSURE,
LOSS OF STARTUP AUXILIARY TRANSFORMER

Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(iv), Georgia Power Company is submitting the enclosed Licensee Event Report (LER) concerning the unanticipated actuations of some Engineered Safety Features (ESFs). This event occurred at Plant Hatch - Unit 1.

Sincerely,

W. G. Hairston, III

SB/ct

Enclosure: LER 50-321/1988-018

c: (see next page)

Georgia Power

U. S. Nuclear Regulatory Commission

c: Georgia Power Company
Mr. H. C. Nix, General Manager - Plant Hatch
Mr. L. T. Gucwa, Manager, Nuclear Engineering and Licensing
GO-NORMS

U. S. Nuclear Regulatory Commission Washington, D. C.
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